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May 7, 2003

Mr. Nabil S. Fayoumi
U. S. Environmental Protection Agency - Region 5
Superfund Division
77 West Jackson Boulevard (SR-6J)
Chicago, Illinois 60604-3590

Re: Response to Comments on Approach for Establishing Performance Monitoring Action Levels
Sauget Area 2 Groundwater Migration Control System
Sauget, Illinois

Dear Mr. Fayoumi:

This letter responds to comments provided by the U. S. Environmental Protection Agency (USEPA) on April 15, 2003 regarding the Remedial Design Work Plan for the Groundwater Migration Control System to be constructed at the Sauget Area 2 Site, immediately downgradient of Site R. All of the comments were directed at the approach that was proposed for establishing performance monitoring action levels for sediments downgradient of the site. We have revised the proposed approach to respond to your comments and three copies of a revised version of the document are attached.

Please review the attachment and let us know if this satisfies you requirements. If you have any questions about the revised document, please either call me at (314) 674-4660 or Richard Williams at (618) 482-6340.

Sincerely,

Solutia Inc.

Richard S Williams

for. Steven D. Smith
Project Coordinator

cc: Ken Bardo – USEPA
Sandra Bron – IEPA
T. Gouger – USACE
Mike Coffey - USF&W
Michael L. Henry - IDNR
Peter Barrett – CH2M HILL
Linda Tape - Husch & Eppenberger
Richard Williams - Solutia
Bruce Yare - Solutia
Gary Vandiver - Solutia

Sediment and Surface Water Monitoring

Section 4.3 of the Statement of Work for the RD/RA stipulates that "An Apparent Effects Threshold approach will be used to derive site-specific, protective constituent concentrations for sediments and a Toxic Units approach will be used to derive site-specific, protective constituent concentrations for surface water."

The discussion below presents these approaches for establishing 'performance monitoring action levels' using the Apparent Effects Threshold (AET) for sediment samples and a Toxic Units (TU) approach for surface waters. The document consists of a background section, AET approach and TU approach.

Background

Previous investigations at Area 2 included surface water and sediment chemistry, surface water and sediment toxicity testing, and benthic community analysis (abundance and diversity). The results for these surface water, sediment, bioassay and community samples are summarized in the Record of Decision (USEPA, 2002). Chemical-specific AET concentrations can be derived from site-specific sampling data summarized in Tables 5-5 and 5-6 from the ROD. Table 5-5 presents a summary of aquatic toxicity test results that can be used as the basis for chemical-specific AET selection. Table 5-6 presents the results of the benthic community sampling effort conducted by Menzie-Cura in 2001. Benthic community data were collected from two locations (UDA-11 and UDA-12) located upstream from Site R. Three sample locations (PDA-2, PDA-7 and PDA-8) were located directly offshore from Site R. Two locations (DDA-1 and DDA-13) were located downstream from Site R.

Sample locations offshore from Site R (PDA-2, PDA-7, and PDA-8) have depauperate benthic communities similar to upstream samples (UDA-11 and UDA-12) and one of the two downstream locations (DDA-13). The other downstream sample (DDA-1) had a higher abundance and diversity of macroinvertebrates. It should be noted that one upstream sample (UDA-11), the off-site samples (PDA-2, PDA-7, and PDA-8), and one downstream sample (DDA-13) were located in sandy bottoms while one upstream sample (UDA-12) and one downstream sample (DDA-1) were located in soft sediments. The location of poorer benthic community diversity samples appears to be better correlated with the type of bottom substrate (sand vs. mud) than with the presence of compounds associated with Site R or upstream or downstream locations. Therefore, the benthic community information will not be used in the development of AETs

Sediment: AET Approach

The apparent effects threshold (AET) is the concentration of a compound in sediments above which toxicity or some adverse effect is always observed. Various aspects of the AET approach have been summarized by USEPA (1992) who stated that the process for

marine sediments had been extensively documented in reports prepared on the generation of Puget Sound AET values and the evaluation of their predictive ability (Beller et al., 1986; Banick et al., 1988). The process was also used to evaluate whether additional biological testing was required for the disposal of dredged sediments from Puget Sound, and the standards developed using the AET approach were promulgated by the State of Washington and approved by EPA Region X in 1991 (USEPA, 1992).

The AET approach was presented in a briefing report to the USEPA Science Advisory Board (USEPA, 1988) and reviewed by the U.S. EPA Science Advisory Board (SAB, 1989), which noted the method had "major strengths in its ability to determine biological effects and assess interactive chemical effects." This approach will be used in preference to comparison to screening values because: (1) the AET is derived on a site-specific basis and relies on site-specific conditions such as COPC binding to organic carbon and bioavailability and, (2) the AET approach provides more certainty that false positives will not be observed.

Threshold effects levels derived for freshwater aquatic organisms (e.g., consensus values from MacDonald et al., 2000 or OME values from Persaud, 1993) have been derived from numerous study locations with characteristics that may or may not be representative of the conditions in the Mississippi River offshore from Site R. Many of the sites evaluated were urban harbors downstream from highly industrialized areas. Furthermore, the contribution to toxicity due to the presence of multiple contaminants at a single location and the variability in bioavailability between sites are confounding variables that have generated a high degree of scientific controversy.

The AET approach will gather previously collected collocated sediment chemistry and associated bioassay data from the studies performed in the Mississippi River in areas potentially affected by groundwater discharge from Site R. These data will be used according to the following hypothetical example protocol to develop AETs for use as performance monitoring action levels for sediments.

Based on data presented in the ROD (USEPA, 2002), sediment samples PDA-9, PDA-5, PDA-3, and PDA-3FD show statistically significant effects compared to controls. These data, together with the statistical analyses, were submitted to the Agencies in the "Ecological Risk Assessment Report for Sauget Area 1", the most recent version of which (Revision 2) is dated June 30, 2001. However, the data and statistical analyses will be reviewed to determine whether standard test protocols (e.g., USEPA, 2000; ASTM, 1994) were followed and which endpoint-specific results are significantly different from controls. Similarly sites UDA-11, UDA-12, PDA-8, PDA-9, PDA-10, PDA-6, PDA-2, PDA-4, DDA-13, and DDA-1 did not show statistically significant effects compared to controls. On a chemical by chemical basis, these unimpacted sites will be sorted by increasing chemical concentration and compared to those sites that did show effects. Then, after verification that statistically significant biological effects are observed at a chemical concentration higher than the highest no-effect concentration, the AET will be selected as the highest no-effect concentration above which effects always

occur. If there are no samples showing effects at chemical-specific concentrations higher that the highest no-effect concentration, the AET should be regarded only as a preliminary minimum estimate (USEPA, 1992). For each chemical, the rankings may be different.
Note also that for each chemical being evaluated, a different value may be selected based upon the chemical-specific concentrations that were associated with each sampling location.

Surface Water: Toxic Units Approach

A "toxic unit" expresses the strength of a chemical (measured in some concentration unit) as a fraction or proportion of its specific threshold effect concentration (measured in the same concentration unit). In the general literature, toxic units are abbreviated as "TU" and subscripts are used to denote whether the TU applies to an acute (e.g., TU_a) or chronic (e.g., TU_c) endpoint. In many instances, TUs are calculated by dividing the chemical concentration in the medium of interest by its respective LC_{50} (concentration lethal to 50% of test organisms). Thus, as an example, a TU greater than 1.0 would indicate a concentration of a compound that would be expected to kill more than half of the organisms and a TU less than 1.0 would indicate a concentration of a compound that would be expected to kill less than half the organisms.

In the case of Area 2, the aquatic threshold concentrations selected to calculate the TUs for the COPCs that could be anticipated to migrate from groundwater to surface water will be the more conservative Tier II Values (Suter and Tsao, 1996). The endpoints for generating these values are typically static bioassays using free-swimming macroinvertebrates (e.g., *Ceriodapnia* or *Daphnia* spp.). The reason for using these values is that, for existing site data, there are very few National Ambient Water Quality Criteria Values available for the COPCs that have been observed in surface water. Additionally, because the selected remedial alternative is a hydraulic pump-and-treat technology, groundwater would not normally be anticipated to migrate into the Mississippi River. Acute Tier II values, therefore, were selected instead of the chronic values because groundwater intrusion into the river and subsequent exposures to COPCs is anticipated to be a transient occurrence resulting from an unplanned event..

A Toxic Unit will be defined as:

$$TU = \frac{[COPC]}{[Tier\ II\ Value]}$$

Where,

- [COPC] is the concentration of the individual site-related constituent of potential concern in surface water (ug/L) and

- [Tier II Value] is the acute Tier II value (presented for each COPC in Table 2).

Because Tier II values are estimated conservatively and therefore considered "screening values" by the scientific community, it is safe to assume that a TU less than 1.0 is sufficient to protect fish and aquatic invertebrates and that greater than 1.0 is reason for concern. Because Tier II values are derived for individual chemicals (not mixtures) using individual bioassays (not microcosms), TUs will not be "summed" to identify a "worst-case" hazard.

Table 2.

Available Tier II Values for COPCs

Analyte	COPC Detected in Surface Water?	Acute Tier II Value (ug/L)
VOCs		
Benzene	Yes	2300
2-Butanone	No	240000
Carbon Disulfide	No	17
Chlorobenzene	Yes	1100
Chloroform	No	490
1,2-Dichloroethane	Yes	8800
cis-1,2-Dichloroethene	No	1100
Ethylbenzene	Yes	130
Methylene Chloride	No	26000
4-methyl-2-Pentanone	Yes	2200
Tetrachloroethylene	No	830
Toluene	Yes	120
Trans-1,2-Dichloroethylene	No	1100
Trichloroethylene	Yes	440
Xylenes	Yes	230
SVOCs		
4-Chloroaniline	Yes	--
2-Chlorophenol	Yes	--
1,2-Dichlorobenzene	Yes	260
1,4-Dichlorobenzene	No	180
2,4-Dichlorophenol	Yes	--
2,4-Dimethylphenol	Yes	--
2-Methylphenol	No	230
3-Methylphenol	Yes	230
4-Methylphenol	Yes	--
Naphthalene	No	190
Nitrobenzene	Yes	--
Phenol	Yes	3600
2,4,6-Trinitrophenol	Yes	--
PESTICIDES		
alpha-BHC	No	39
alpha-Chlordane	No	2.4
gamma-Chlordane	No	2.4
4,4'-DDD	No	0.19
Dieldrin	No	0.18
Heptachlor epoxide	No	0.125
HERBICIDES		
2,4-D	Yes	--
Dicamba	Yes	--
Dichlorprop	Yes	--
Pentachlorophenol	Yes	--
2,4,5-T	Yes	--
Silvex	Yes	--
Dioxin	Yes	--

--, no data available

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